# Requirement for Minor in Computer Science & Engineering

## (Six theory courses and one lab course)

**Important Instructions:**

1. A total of 6 theory courses must be taken.
2. The courses marked with * are compulsory.
3. For Electives I, II and III, CSE department electives of B.Tech/M.Tech level may be chosen.
4. The course Design and Analysis of Algorithms (Course No. MA30207) offered by Mathematics department in 3rd year can be taken in lieu of theory course Algorithms - I (Course No. CS21203) but the Algorithms Laboratory (Course No. CS29203) must be taken.

| Sl No. | Course Number | Course Name | L-T-P | Credits |
|---|---|---|---|---|
| 1* | CS21203 OR MA30207 | Algorithms - I OR Design and Analysis of Algorithms (offered by Mathematics Dept.) (CS21203)F4-Autumn D4-Spring3r MA30207 A3-Autumn4 | 3-1-0 | 4 |
| 2* | CS29203 | Algorithms Laboratory CS29203 Lab-N Autumn4th-A | 0-0-3 | 2 |
| 3* | CS21202 OR EC21202 | Switching Circuits and Logic Design OR Digital Electronic Circuits (offered by E&ECE Dept.) CS21202 C4-Spring2nd Spri EC21202 C4-Spring | 3-1-0 | 4 |
| 4* | CS31702 | Computer Architecture and Operating Systems CS31702 D4 - Spring | 4-0-0 | 4 |
| 5 | | Elective – I | 3-0-0 | 3 |
| 6 | | Elective – II | 3-0-0 | 3 |
| 7 | | Elective – III | 3-0-0 | 3 |

C4-spring no

# Requirements for Earning a *Minor in* Chemical Engineering

The following three theory and one laboratory courses are **compulsory** for earning a **Minor in Chemical Engineering**.

**1. Mass Transfer I (CH21202) 3-1-0 4 credits**
**2. Reaction Engineering (CH21206) 3-1-0 4 credits**
**3. Transport Phenomena (CH30012) 3-1-0 4 credits**
**4. Mass Transfer Laboratory (CH39006) 0-0-3 2 Credits**

Any three of the following courses are to be taken for completing the **Minor** requirements.

| Sub. No. | Subject Name | Semester | Prerequisite | L-T-P | Credits |
|---|---|---|---|---|---|
| CH21207 | Fluid Mechanics | 3 | None | 3-1-0 | 4 |
| CH21204 | Heat Transfer | 4 | None | 3-1-0 | 4 |
| CH21201 | Chemical Engg. Thermodynamics | 3 | None | 3-1-0 | 4 |
| CH21205 | Mechanical Operations | 3 | None | 3-1-0 | 4 |
| CH31010 | Mass Transfer II | 5 | CH21202 | 3-1-0 | 4 |
| CH21208 | Instrumentation and Process Control | 4 | Transform Calculus (MA20202) & Fluid Mechanics (CH21207) | 3-1-0 | 4 |
| CH31203 | Computer Aided Process Engineering | 5 | Transform Calculus (MA20202) & CH21202 | 3-1-0 | 4 |
| | | | | | |

## Minor requirement in Biotechnology and Biochemical engineering

## (Six theory subjects and Three lab courses)

| Course No. | Course Name | L | T | P | Credits |
|---|---|---|---|---|---|
| **BT20203** | **BIOCHEMISTRY** | 3 | 0 | 0 | 3 |
| **BT20205** | **MICROBIOLOGY** | 3 | 0 | 0 | 3 |
| **BT20207** | **BIOCHEMICAL REACTION ENGINEERING & BIOENERGETICS** | 3 | 0 | 0 | 3 |
| **BT29205** | **MICROBIOLOGY LAB** | 0 | 0 | 3 | 2 |
| **BT29207** | **BIOCHEMICAL ENGINEERING LAB** | 0 | 0 | 3 | 2 |
| **BT20204** | **CELL AND MOLECULAR BIOLOGY** | 3 | 0 | 0 | 3 |
| **BTXXXXX (Old Number BT40009)** | **BIOPROCESS TECHNOLOGY** | 3 | 0 | 0 | 3 |
| **BT31006** | **BIOINFORMATICS** | 3 | 0 | 0 | 3 |
| **BT39008** | **BIOINFORMATICS LAB** | 0 | 0 | 3 | 2 |
| **TOTAL** | | | | | **24** |

## REQUIREMENT FOR MINOR IN AEROSPACE ENGINEERING

Following courses need to be taken to earn a Minor in Aerospace Engineering

| Sl. No. | Subject No.- New number (Old number) | Subject Name | Semester | Prerequisite | L-T-P | Credit |
|---|---|---|---|---|---|---|
| 1 | AE21201 (AE21001) | Introduction to Aerodynamics | 3rd | None | 3-1-0 | 4 |
| 2 | AE21205 (AE31001) | Thermodynamics and Aerospace Propulsion Systems | 3rd | None | 3-1-0 | 4 |
| 3 | AE21202 (AE21002) | Low Speed Aerodynamics | 4th | AE21201 | 3-1-0 | 4 |
| 4 | AE29202 (AE29002) | Aerodynamics Laboratory - I | 4th | AE21201 | 0-0-3 | 2 |
| 5 | AE21204 (AE21004) | Introduction to Aerospace Structures | 4th | None | 3-1-0 | 4 |
| 6 | AE29204 (AE29004) | Structures Laboratory - I | 4th | None | 0-0-3 | 2 |
| 7 | AE31007 (AE31007) | Mechanics of Flight | 5th | AE21201 | 3-1-0 | 4 |
| | | | | | | 24 |

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# PROPOSAL FOR **MINOR** IN PHYSICS

**Note:** Subject number is given if it exists already. Semester number in the brackets specifies where the subject is placed in the BS curriculum.

| **Subject** | **Type** | **L-T-P** | **Credit** |
|---|---|---|---|
| | | | |
| Electromagnetism PH21203 (Sem 3)<br>**OR**<br>Electrodynamics (Sem 5) | Core | 3-1-0 | 4 |
| Quantum Physics PH21206 (Sem 4)<br>**OR**<br>Quantum Mechanics (Sem 5) | Core | 3-1-0 | 4 |
| Classical Dynamics and Special Relativity PH21201 (Sem 3)<br>**OR**<br>Classical Mechanics (Sem 5) | Core | 3-1-0 | 4 |
| Statistical Physics (Sem 6) | Core | 3-1-0 | 4 |
| Elective 1[*] | Elective | 3-0-0 | 3 |
| Elective 2[*] | Elective | 3-0-0 | 3 |
| Laboratory[#] | Lab | 0-0-3 | 2 |
| | | | |
| **Total credits** | | | **24** |

[*] All listed electives in the BS curriculum are available for aspiring Minor students. In addition, all 3rd and 4th year BS core courses (except the Computational Physics course) which are NOT included in the Minor Core list may be taken as Electives by students opting for Minor.

[#] Any BS 3rd year lab course (except Computational Physics Lab) can be taken as a Lab course by a Minor aspirant.

# REQUIREMENT FOR MINOR IN "CLIMATE SCIENCE" OF CORAL

| Subject Number | Subject Name | Semester | L-T-P | Credit |
|---|---|---|---|---|
| **All are Compulsory subjects (12 Credits)** | | | | |
| CL60216 | Physics of Climate System | 2 | 3-0-0 | 3 |
| CL60210 | Climate Modelling | 2 | 3-0-0 | 3 |
| CL61203 | Computational Methods for Earth System Science | 1 | 3-1-0 | 4 |
| CL67022 | Project I | 2 | 0-0-3 | 2 |
| **Elective (Any four for 12 Credits)** | | | | |
| | | | | |
| CL61011 | Global Climate System and Cloud-Precipitation Processes | 2 | 3-1-0 | 4 |
| CL61206 | Satellite Remote Sensing Exploration of the Ocean and Climate | 2 | 3-1-0 | 4 |
| CL60015 | Modelling of Extreme Events | 1 | 3-0-0 | 3 |
| CL60207 | Weather Analysis and Prediction | 1 | 3-0-0 | 3 |
| CL60019 | Carbon Cycle and Global Climate Change | 1 | 3-0-0 | 3 |
| CL60201 | Physical Oceanography and Climate | 1 | 3-0-0 | 3 |

## REQUIREMENT FOR MINOR IN AGRICULTURAL AND FOOD ENGINEERING

| Subject Number | Subject Name | Semester | Pre-requisite | L-T-P | Credit |
|---|---|---|---|---|---|
| | **Core Subjects** | | | | |
| AG31003 | Land and Water Resources Engineering | 5th | None | 3-1-0 | 4 |
| AG31005 | Principles of Food Engineering | 5th | None | 3-1-0 | 4 |
| **New** | Off- Road Vehicle Systems | 6th | None | 3-0-0 | 3 |
| | **Laboratory Subjects (any two)** | | | | |
| AG39003 | Land and Water Resources Engineering Lab | 5th | None | 0-0-3 | 2 |
| AG39005 | Food Engineering Lab | 5th | None | 0-0-3 | 2 |
| **New** | Off- Road Vehicle Systems Lab | 6th | None | 0-0-3 | 2 |
| | **Elective I (any one)** | | | | |
| AG20101 | Crop Production Technology | 4th | None | 3-0-0 | 3 |
| AG20103 | Soil Technology | 3rd | None | 3-0-0 | 3 |
| **New** | Biotechnological Interventions in Modern Agriculture | 5th | None | 3-0-0 | 3 |
| | **Elective – II (any one)** | | | | |
| **New** | Farm Machinery Manufacturing Practices | 5th | None | 3-0-0 | 3 |
| **New** | Uncertainty Concepts in Hydrosystem Engineering | 5th | None | 3-0-0 | 3 |
| AG40005 | Mechanical Operations in Food Processing | 7th | None | 3-0-0 | 3 |
| | **Elective – III (any one)** | | | | |
| **New** | Automation of Agricultural Machines | 5th | None | 3-0-0 | 3 |
| AG40011 | Tube wells and Pumps | 7th | None | 3-0-0 | 3 |
| AG40015 | Thermal Operations in Food Processing | 7th | None | 3-0-0 | 3 |

# DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING

## MINOR IN INDUSTRIAL ENGINEERING

Pre-requisite, six theory subjects and one laboratory subject need be taken as listed:

**PRE-REQUISITE**

| SL | Sub. No. | Subject Name | L-T-P | C | Prerequisite |
|---|---|---|---|---|---|
| 1. | MA20205 | Probability and Statistics | 3-0-0 | 3 | |

**COMPULSORY SUBJECTS (TOTAL THREE)**

| SL | Sub. No. | Subject Name | L-T-P | C | Prerequisite |
|---|---|---|---|---|---|
| 1. | | Operations Research-I* | 3-1-0 | 4 | None |
| 2. | | Work System Design | 3-0-0 | 3 | None |
| 3. | | Production Planning and Control | 3-1-0 | 4 | OR-I* |

*Operations Research (IM20204) or Operations Research (MA30014) may be considered as substitute

**COMPULSORY LABORATORY**

| | | | | | |
|---|---|---|---|---|---|
| 1. | | Operations Research Laboratory** | 0-0-3 | 2 | OR-I* |

** Operations Research Laboratory (MA39014) may be considered as substitute

**ELECTIVE SUBJECTS (ANY THREE)**

| SL | Sub. No. | Subject Name | L-T-P | C | Prerequisite |
|---|---|---|---|---|---|
| 1. | | Operations Research –II | 3-1-0 | 4 | OR-I* |
| 2. | | Production Design and Process Planning | 3-1-0 | 4 | OR-I* |
| 3. | | Engineering Economy | 3-1-0 | 4 | None |
| 4. | | Quality Design and Control | 3-1-0 | 4 | OR-I* Probability and Statistics |
| 5. | | Simulation | 3-0-0 | 3 | OR-I* |
| 6. | | Supply Chain Management | 3-1-0 | 4 | OR-I* |
| 7. | | Management of Inventory Systems | 3-1-0 | 4 | PPC |
| 8. | | Statistical Learning with Applications | 3-1-0 | 4 | OR-I* Probability and Statistics |

*Operations Research (IM20204) or Operations Research (MA30014) may be considered as substitute

**Proposed Curriculum for**

# Minor in Chemistry

Requirement:
Group I subjects are compulsory; minimum one from Gr. II and minimum three from Gr. III

| Group | Number | Subject | L-T-P | Credit |
|---|---|---|---|---|
| I | CY21203 | Molecular Structure and Bonding | 3-1-0=4 | 4 |
| I | CY21205 | Fundamentals of Organic Reactions | 3-1-0=4 | 4 |
| I | CY20202 | Physical Chemistry 2 | 3-0-0=3 | 3 |
| | | | | |
| II | CY29201 | Physical Chem Lab 1 | 0-0-3=2 | 2 |
| II | CY29202 | Organic Chem Lab 1 | 0-0-3=2 | 2 |
| II | CY29204 | Inorganic qualitative analysis Lab | 0-0-3=2 | 2 |
| | | | | |
| III | | Introduction to Quantum Chemistry and Spectroscopy | 3-1-0=4 | 4 |
| III | | Computational Chemistry | 2-0-3=4 | 4 |
| III | | Biophysical Chemistry | 3-1-0=4 | 4 |
| III | | Polymer Chemistry | 3-0-0=3 | 3 |
| III | | Instrumental Methods of Analysis | 3-0-0=3 | 3 |
| III | | Analytical and Nuclear Chemistry | 3-0-0=3 | 3 |
| III | | Metal Complexes in Catalysis | 3-1-0=4 | 4 |
| III | | Chemistry of Materials | 3-1-0=4 | 4 |
| III | | Spectroscopic Methods of Structure Determination | 3-1-0=4 | 4 |
| III | | Structure and function of Biomolecules | 3-1-0=4 | 4 |
| III | | Enzymes in Organic Synthesis | 3-0-0=3 | 3 |
| III | | Drug Design and Development | 3-0-0=3 | 3 |

## REQUIREMENTS FOR MINOR IN ECONOMICS (NEW CURRICULUM)

Six theory and one laboratory subjects are to be chosen to earn a Minor in Economics. Group A courses are compulsory. From group B and C each, any two subjects should be selected covering any one Lab subject under group C. From D, any one subject should be selected.

| GROUP A (Compulsory Subjects) | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Subject No.** | **Subject Name** | **L-T-P** | **Credit** | **Prerequisites** |
| 1 | HSXXXXX | Microeconomics I | 3-1-0 | 4 | None |
| 2 | HSXXXXX | Macroeconomics I | 3-1-0 | 4 | None |

| GROUP B (Any Two Subjects) | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Subject No.** | **Subject Name** | **L-T-P** | **Credit** | **Prerequisites** |
| 1 | HSXXXXX | Public Finance | 3-1-0 | 4 | Microeconomics I/ Economics (HS21201) |
| 2 | HSXXXXX | Economics of Growth | 3-0-0 | 3 | Macroeconomics I |
| 3 | HSXXXXX | General Equilibrium & Welfare Economics | 3-0-0 | 3 | Microeconomics I |
| 4 | HSXXXXX | International Economics I | 3-1-0 | 4 | Microeconomics I |
| 5 | HSXXXXX | Monetary Economics | 3-0-0 | 3 | Macroeconomics I |
| 6 | HSXXXXX | Theory of Social Choice | 3-0-0 | 3 | General Equilibrium and Welfare Economics |
| 7 | HSXXXXX | Behavioural Economics | 3-0-0 | 3 | Microeconomics I and Macroeconomics I |

| GROUP C (Two Subjects Covering Any One Theory and Any One Lab Course) | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Subject No.** | **Subject Name** | **L-T-P** | **Credit** | **Prerequisites** |
| 1 | HSXXXXX | Econometric Analysis I | 3-0-0 | 3 | Probability and Statistics/Statistics for Economics |
| 2 | HSXXXXX | Econometric Analysis I Lab | 0-0-3 | 2 | Econometric Analysis I |
| 3 | HSXXXXX | Economic Data Analysis Lab | 0-0-3 | 2 | None |
| 4 | HSXXXXX | Primary Research Lab | 0-0-3 | 2 | None |
| 5 | HSXXXXX | Economic Decisions Lab | 0-0-3 | 2 | Microeconomics II |
| 6 | HSXXXXX | Economic Modelling | 3-0-0 | 3 | Microeconomics I and Macroeconomics I |

| GROUP D (Any One Subject) | | | | | |
|---|---|---|---|---|---|
| **Sl. No.** | **Subject No.** | **Subject Name** | **L-T-P** | **Credit** | **Prerequisites** |
| 1 | HSXXXXX | Indian Economy | 3-0-0 | 3 | None |
| 2 | HSXXXXX | Development Economics | 3-1-0 | 4 | None |
| 3 | HSXXXXX | Public Policy | 2-1-0 | 3 | None |
| 4 | HSXXXXX | Labour Economics and Policy | 3-1-0 | 4 | Microeconomics I/Economics (HS21201) |
| 5 | HSXXXXX | Environmental Economics | 3-0-0 | 3 | Microeconomics I/Economics (HS21201) |
| 6 | HSXXXXX | Food Security and Poverty Studies | 3-0-0 | 3 | None |
| 7 | HSXXXXX | Economics of Sustainable Development | 3-0-0 | 3 | None |
| 8 | HSXXXXX | Energy Economics and Policy | 3-0-0 | 3 | None |

# Requirement for Minor In Geology

**For a minor in Geology**, a student must take subjects listed against **Serial No. 1,2,3, are compulsory**. In addition, a student has to take any three from the rest. The pre-requisites for the subjects will be the same as stated previously.

**Mining Engineering students who have already cleared similar courses as mention in Serial No. 1 are exempted for the compulsory Serial Number 1.**

(Minimum credits as per institute rule need to be earned for a Minor in Geology).

| SL. | SUBJECT CODE | NAME OF SUBJECT | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | GG21207 | INTRODUCTION TO EARTH SCIENCE | 4 | 0 | 0 | 4 |
| | GG29209 | INTRODUCTORY EARTH SCIENCE LAB | 0 | 0 | 3 | 2 |
| 2 | GG20211 | MINERALOGY | 3 | 0 | 0 | 3 |
| | GG29206 | OPTICAL MINERALOGY LAB | 0 | 0 | 3 | 2 |
| 3 | GG20210 | PALEONTOLOGY AND STRATIGRAPHY | 3 | 0 | 0 | 3 |
| 4 | GG30208 | ECONOMIC GEOLOGY | 3 | 0 | 0 | 3 |
| | GG39204 | ECONOMIC GEOLOGY LAB | 0 | 0 | 3 | 2 |
| 5 | GG30216 | IGNEOUS PETROLOGY | 3 | 0 | 0 | 3 |
| 6 | GG30210 | METAMORPHIC PETROLOGY | 3 | 0 | 0 | 3 |
| 7 | GG20203 | SEDIMENTOLOGY | 3 | 0 | 0 | 3 |
| 8 | GG21204 | STRUCTURAL GEOLOGY | 3 | 1 | 0 | 4 |
| 9 | GG40218 | REMOTE SENSING AND GIS | 3 | 0 | 0 | 3 |
| | GG49210 | REMOTE SENSING AND GIS LABORATORY | 0 | 0 | 3 | 2 |
| 10 | GG30217 | ENGINEERING GEOLOGY | 3 | 0 | 0 | 3 |
| 11 | GG40214 | HYDROGEOLOGY | 3 | 0 | 0 | 3 |
| 12 | GG30211 | GEOCHEMISTRY | 3 | 0 | 0 | 3 |
| | GG39201 | GEOCHEMISTRY LAB | 0 | 0 | 3 | 2 |

# Requirements for Minior In GEOPHYSICS

Any six subjects ***with at least one subject with a Lab*** from the below list can be chosen to earn a ***Minor in Geophysics***. **Partial Differential Equations and Transform Calculus remain the prerequisite** for all the courses (Minimum credits as per institute rule need to be earned for a Minor in Geophysics)..

| SL. | SUBJECT CODE | NAME OF SUBJECT | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | GG20205 | INTRODUCTORY GEOPHYSICS | 3 | 0 | 0 | 3 |
| 2 | GG21202 | GEOPHYSICAL SIGNAL PROCESSING | 3 | 0 | 0 | 3 |
| 3 | GG30203 | ELECTRICAL METHODS OF PROSPECTING | 3 | 0 | 0 | 3 |
| | GG39209 | ELECTRICAL METHODS OF PROSPECTING LAB | 0 | 0 | 3 | 2 |
| 4 | GG31203 | SEISMIC METHODS OF PROSPECTING | 3 | 1 | 0 | 4 |
| | GG39205 | SEISMIC METHODS OF PROSPECTING LAB | 0 | 0 | 3 | 2 |
| 5 | GG30212 | ELECTROMAGNETIC METHODS OF PROSPECTING | 3 | 0 | 0 | 3 |
| | GG39208 | ELECTROMAGNETIC METHODS OF PROSPECTING LAB | 0 | 0 | 3 | 2 |
| 6 | GG31201 | SEISMOLOGY | 3 | 1 | 0 | 4 |
| 7 | GG31204 | GRAVITY & MAGNETIC METHODS OF PROSPECTING | 3 | 1 | 0 | 4 |
| | GG39210 | GRAVITY & MAGNETIC METHODS OF PROSPECTING LAB | 0 | 0 | 3 | 2 |
| 8 | GG40229 | BOREHOLE GEOPHYSICS | 3 | 0 | 0 | 3 |
| | GG39207 | BOREHOLE GEOPHYSICS LAB | 0 | 0 | 3 | 2 |
| 9 | GG40223 | RADIOMETRIC METHODS OF PROSPECTING | 3 | 0 | 0 | 3 |
| | GG49207 | RADIOMETRIC METHODS OF PROSPECTING LAB | 0 | 0 | 3 | 2 |
| 10 | EX30004 | GEOPHYSICAL FIELD THEORY | 3 | 1 | 0 | 4 |
| 11 | GG31202 | GEOPHYSICAL INVERSE THEORY | 3 | 1 | 0 | 4 |

**REQUIREMENTS FOR MINOR IN MATHEMATICS AND COMPUTING BS 4 year_NEW CURRICULUM**

**Five theory and two laboratory subjects are to be chosen to earn a minor in Mathematics and Computing with at least one from Group A, at least one from Group B and at least one from Group C.**

**GROUP A**

| Sub. No | Sub. Name | Semester In which it is offered | Pre-requisite | L-T-P | Credits |
|---|---|---|---|---|---|
| MA21201 | Real Analysis | 3rd | Advanced Calculus (MA11003) MA21201 D4-A | 3-1-0 | 4 |
| MA20206 | Theory of Computations | 4th | MA20206 U3-Spring | 3-0-0 | 3 |
| MA21202 | Modern Algebra | 4th | MA21202 U4-Spring | 3-1-0 | 4 |
| MA30008 | Topology | 5th | Real Analysis(MA21201) MA30008 D4-Autumn | 3-0-0 | 3 |
| MAXXXX | Advanced Linear Algebra V3-Autumn | 6th | Linear Algebra, Numerical and Complex analysis((MA11004) | 3-0-0 | 3 |
| MA20203 | Theory of PDE | 3rd | MA20203 B3-Autumn | | |
| MA21007 | Design and Analysis of Algorithms | 5th MA30207A3-Au | Programming and Data Structures(CS10003) | 3-0-0 | 3 |
| MA29005 | Design and Analysis of Algorithms Laboratory | 5th Slot X | LAB course for Design and Analysis of Algorithms(MA21007) | 0-0-3 | 2 |

## GROUP B

| Sub. No | Sub. Name | Semester In which it is offered | Pre-requisite | L-T-P | Credits |
|---|---|---|---|---|---|
| MA20208 | Stochastic process and Applications | 4th | Probability and Statistics MA20208 E3-Spring | 3-0-0 | 3 |
| MA20204 | Applied Computational Methods | 4th MA20204B3 S | Numerical solution of ordinary and PDE(MA20201) | 3-0-0 | 3 |
| MA29202 | Numerical Methods Laboratory | 4th MA29202X | LAB course for Applied Computational Methods(MA20204) | **3-0-0** | **3** |
| MA61019 | Optimization Techniques | 5th | MA61019 C4-AutumnU4-Sprin | **3-0-0** | **4** |
| MAXXXXX | Optimization Techniques Lab | 5th | Optimization Techniques | **0-0-3** | **2** |
| MAXXXXX | Mathematical Modelling | 6th | Theory of PDE (MA20203) | **3-0-0** | **3** |
| MA51108 | Modelling and Simulation Lab | 6th | Mathematical Modelling MA51108 E4-Spring | **0-0-3** | **2** |
| **MA51002** | Measure Theory and Integrations | 6th | Real Analysis( MA21201) MA51002 C4-Spring | **3-0-0** | **3** |

## GROUP C

| Sub. No | Sub. Name | Semester<br>In which it is offered | Pre-requisite | L-T-P | Credits |
|---|---|---|---|---|---|
| MA31009 | Computer Organisation and Architecture | 5th | MA60259 E3-Autumn | **3-0-0** | **3** |
| MAXXXXX | Computer Organisation and Architecture Lab | 5th | Computer Organisation and Architecture | **0-0-3** | **2** |
| MA40004 | File Organization and Database Systems | 6th | Programming and Data Structures(CS10003)<br>MA40004 G3+S3-spring | **3-0-0** | **3** |
| MAXXXXX | File Organization and Database Systems Lab | 6th | File Organization and Database Systems | **0-0-3** | **2** |
| MAXXXX | AI and ML | 8th | | 3-0-0 | 3 |
| MAXXXX | AI and ML LAB | 8th | AI and ML | 0-0-3 | 2 |
| MA41007 | Functional Analysis<br>MA41211 U4-Autumn | 7th | Real Analysis(MA21201)<br>or<br>Measure Theory and Integrations MA51002 | 3-0-0 | 3 |

# Minor Requirements in Mechanical Engineering

Six subjects and one lab are to be chosen from the following three groups to earn a minor in Mechanical Engineering with at least one subject from each group.

• Total Credit Requirement – Minimum 25

| Number | Subject | L-T-P | CREDIT |
|---|---|---|---|
| | ***GROUP A*** | | |
| ME31007 | Casting Forming & Welding | 3-1-0 | 4 |
| ME3XXXX | Machine Tool & Machining | 3-1-0 | 4 |
| ME39007 | *Casting Forming & Welding Lab* | 0-0-3 | 2 |
| | ***GROUP B*** | | |
| ME21101 | Fluid Mechanics | 3-1-0 | 4 |
| ME22002 | Basic Thermodynamics | 3-1-0 | 4 |
| ME30005 | Heat Transfer | 3-1-0 | 4 |
| ME3XXXX | Applied Thermodynamics | 3-1-0 | 4 |
| ME3XXXX | *Thermofluids Laboratory* | 0-0-3 | 2 |
| ME4XXXX | *Thermal Engineering Laboratory* | 0-0-3 | 2 |
| | ***GROUP C*** | | |
| ME20001 | Dynamics | 3-1-0 | 4 |
| ME3XXXX | Kinematics and Kinetics of Machines | 3-1-0 | 4 |
| ME2XXXX | Mechanics of Solids | 3-1-0 | 4 |
| ME30602 | *Design of Machine Elements* | 3-1-0 | 4 |
| ME2XXXX | *Mechanics of Solids Lab* | 0-0-3 | 2 |
| ME3XXXX | *Machine Drawing* | 0-0-3 | 2 |

## Minor Requirements in Mechanical Engineering
## for Students of Manufacturing Science and Engineering

All the subjects from Group – A, any three subjects from Group - B and one lab from Group – C are to be chosen to earn a minor in Mechanical Engineering

• Total Credit Requirement – Minimum 23

| Number | Subject | L-T-P | CREDIT |
|---|---|---|---|
| | ***GROUP A*** | | |
| ME20706 | Thermo-Fluid Science | 3-1-0 | 4 |
| ME3XXXX | Kinematics and Kinetics of Machines | 3-1-0 | 4 |
| ME30702 | Applied Thermodynamics | 3-1-0 | 4 |
| | ***GROUP B*** | | |
| ME60413 | Continuum Mechanics | 3-1-0 | 4 |
| ME41610 | Automobile Engineering | 3-0-0 | 3 |
| ME41601 | Soft Computing | 3-0-0 | 3 |
| ME41603 | Vibration and Noise Control | 3-0-0 | 3 |
| ME60103 | Machinery Fault Diagnostics and Signal Processing | 3-1-0 | 4 |
| ME40107 | Air Conditioning | 3-0-0 | 3 |
| *ME60134* | Numerical Modelling of Manufacturing Processes | 4-0-0 | 4 |
| ME41616 | Micro-scale fluid flow and heat transfer | 3-0-0 | 3 |
| ME40406 | Turbo Machinery | 3-0-0 | 3 |
| ME60407 | Finite Element Methods in Engineering | 3-1-0 | 4 |
| MEXXXX | Fluid Dynamics | 3-1-0 | 4 |
| ME60012 | Computational Fluid Dynamics | 3-1-0 | 4 |
| | ***GROUP C*** | | |
| ME3XXXX | *Thermofluids Laboratory* | 0-0-3 | 2 |
| ME2XXXX | *Mechatronics Laboratory* | 0-0-3 | 2 |

## Minor Requirement in Manufacturing Science and Engineering
## for students of Mechanical Engineering

All the subjects from Group A, Three subjects from Group B, one Lab from Group C
Total Credit Requirement – Minimum 23

| Number | Subject | L-T-P | CREDIT |
|---|---|---|---|
| | ***GROUP A*** | | |
| ME60352 | Robots | 3-1-0 | 4 |
| MF3XXXX | Non Traditional Manufacturing | 3-1-0 | 4 |
| MF3XXXX | Computer Integrated Manufacturing | 3-1-0 | 4 |
| | ***GROUP B*** | | |
| ME60350 | Metal Forming Processes | 4-0-0 | 4 |
| ME41601 | Soft Computing | 3-0-0 | 3 |
| ME60137 | Manufacturing Resource Planning | 4-0-0 | 4 |
| ME6XXXX | Additive Manufacturing | 4-0-0 | 4 |
| ME60215 | Theory of Abrasive Machining | 3-0-0 | 3 |
| ME60302 | Laser processing of Materials | 4-0-0 | 4 |
| ME60304 | Product Development and CIM | 4-0-0 | 4 |
| ME60134 | Numerical Modelling of Manufacturing Processes | 4-0-0 | 4 |
| ME41616 | Micro-scale fluid flow and heat transfer | 3-0-0 | 3 |
| ME60114 | Surface Engineering Material Technology | 4-0-0 | 4 |
| ME60306 | Precision and Micro Manufacturing | 3-0-0 | 3 |
| | ***GROUP C*** | | |
| | NTN Lab | 0-0-3 | 2 |
| | CIM Lab | 0-0-3 | 2 |

# DEPARTMENT OF ELECTRONICS and ELECTRICAL COMMUNICATION ENGINEERING

## MINOR IN ELECTRONICS and ELECTRICAL COMMUNICATION ENGINEERING

Six Theory subjects and two laboratory subjects need be taken as listed:

### COMPULSORY SUBJECTS (TOTAL THREE)

| SL | Sub. No. | Subject Name | L-T-P | C | Prerequisite |
|---|---|---|---|---|---|
| 1. | EC21207 | Analog Electronic Circuits | 3-1-0 | 4 | EC21207 F4 Autumn |
| 2. | EC21202 | Digital Electronic Circuits | 3-1-0 | 4 | EC21207 EC21202 C4-SPRING |
| 3. | EC31203 | Communication -I | 3-1-0 | 4 | EC31203 D4-Autumn |

Note: EC21207 and EC21202 can be replaced by EE21205 (Analog Electronic Circuits) and EE21208 (Digital Electronic Circuits) for EE students. EC21202 can be replaced by CS21202 (Switching circuits and Logic Design) for CSE students.

### COMPULSORY LABORATORY

| | | | | | |
|---|---|---|---|---|---|
| 1. | EC29207<br>OR<br>EC29202 | Analog Circuits Laboratory<br>OR<br>Digital Circuits Laboratory | 0-0-3 | 2 | EC29207 J X4-A |
| 2. | EC39001 | Analog Communications Laboratory | 0-0-3 | 2 | |

Note: EC29207 or EC29202 can be replaced by EE29208 (Electronic Circuits Laboratory) for EE students or CS29204 (Switching Circuits Laboratory) for CSE students.

### ELECTIVE SUBJECTS (ANY THREE)

| SL | Sub. No. | Subject Name | L-T-P | C | Prerequisite |
|---|---|---|---|---|---|
| 1. | EC21203 | Network Theory | 3-1-0 | 4 | |
| 2. | EC21205 | Semiconductor Devices | 3-1-0 | 4 | |
| 3. | EC21206 | Electromagnetic Engg. | 3-1-0 | 4 | |
| 4. | EC21208 | Signals and Systems | 3-1-0 | 4 | |
| 5. | EC21210 | Systems and Control | 3-1-0 | 4 | EC21203 |
| 6. | EC31005 | RF and Microwave Engg. | 3-1-0 | 4 | EC21206 |
| 7. | EC31201 | Digital Signal Processing-1 | 3-1-0 | 4 | EC21208 |